# 152 - THE IMPORTANCE OF VENOUS BLOOD LACTATE FOR EARLY DISEASES' DIAGNOSIS THAT REQUIRE DAILY ROUTINES AND LOW COST

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**Introduction**

Clinical findings and results of laboratory tests at the time of patients' admission in the intensive care unit (ICU) reflect the recent pathophysiological events. The events of hours of admission are generally the evolutionary sequence of those events. Based on this, the changes of these parameters at the time of admission, as well as the evolution of the patients in the ICU, can be used to establish the probability of the risk of death in both adults and in children, and the level of blood lactate is one of the most employees for this purpose.

The lactate is an important intermediate product of the metabolism of carbohydrates, formed from the action of lactic dehydrogenase on the pyruvate. The lactic acidosis is a fairly common problem in critically ill patients.

It is estimated that lactic acidosis occurs in about 1% of all hospitalized patients. The occurrence of acidosis is accompanied with high mortality and morbidity. It is therefore necessary, whenever possible, avoid the appearance of acidosis or treat it aggressively.

The patients undergoing circulation extracorporeal can develop lactic acidosis by a number of reasons, among which stand out as the most frequent hypoxia and ischemia. The reduction of blood flow to the tissues due to insufficient or inadequate flow of infusion or due to vasoconstriction predominates in the pathophysiology determinant of lactic acidosis, especially in children.

The lactate is produced in all tissues at a rate of 1 mmol / kg / h, but the muscles, brain, the red blood cells and kidney marrow are responsible for producing most of the body's lactate. The normal levels of blood lactate in the blood are approximately up to 14.4 mg / dL or 1.60 mmol / L while in venous blood levels are slightly higher, the order of up to 19.8 mg / dL or 2.20 mmol / L.

Only 2% of existing blood lactate is excreted through urine, but the occurrence of an excess of lactate in the blood, eliminating urine can reach values higher, around 10-12%. The liver and kidneys are large consumers of lactate and, under normal conditions, are organs with the ability to use up to 60% of lactate available.

The levels of blood lactate have been used in several situations, such as a marker of tissue hypoperfusion in patients with shock, adequate indicator of resuscitation after the shock, prognostic index post-resuscitation and prognostic factor in cases of serious diseases (mainly sepsis).

Despite the complexity of the biochemical pathways in relation to the kinetics of blood lactate, it is better prognostic index, in severe patients, than the variables derived from the tissue oxygenation - DO2 and VO2[12].

Tissue perfusion can be conceptualized as the product of capillary flow for the content of nutrients and oxygen to the tissues supplied. Thus, two variables are important: flow and oxygen content. Flux can be understood as cardiac output and its distribution, while the analysis of the content takes into account the serum concentration of hemoglobin, the saturation and the partial pressure of arterial oxygen[2].

Most cases of hyperlactate in serious patients are due to inadequate tissue oxygenation. This, in turn, can be originated from respiratory disorders with insufficient oxygenation of the blood or because of circulatory changes that determine tissue hypoperfusion. The hypoperfusion can be characterized by an imbalance between supply and consumption of oxygen by tissue, thus providing a failure to meet the metabolic needs, culminating in the high risk of multiple organic dysfunctions[3]. As patients do not always with hypoperfusion have tissue clinical exteriorization, the hyperlactatemia may be the only marker of this change.

Sepsis is a systemic inflammatory response syndrome secondary to a confirmed or suspected infection. Severe sepsis and septic shock spectra represent the most serious of síndrome[1]. Shock is characterized by a reduction, absolute or relative, the supply of oxygen to tissues, secondary to severe disturbances perfusion, triggering an anaerobic metabolism. The event is the final process of organ dysfunction, leading to cause of death in this population.

The septic shock is one of the causes of death increasingly frequent in intensive care units around the world, taking the following factors contributing to their appearance: the growing population of elderly (greater than sixty-five (65) years); the longer survival of several debilitating diseases, the most frequent invasive techniques (bladder catheters, tubes endotracheal, intravascular catheters etc); care to greater numbers of immunocompromised patients and hospital's infections[13, 14].

The mortality of sepsis exceeds 40% and it is estimated that 35 to 40% of septic patients to develop a state of shock.

The clinical manifestations of sepsis infection stemming from the primary process, the underlying inflammatory process and organ dysfunction installed or in installation.

Essentially, any microbe can cause sepsis or septic shock (bacteria, viruses, fungi, protozoa), but the bacteria are the most common etiologic agents. Most cases of sepsis are due to gram-negative bacteria (E. coli, Klebsiella pneumoniae, Enterobacter sp, Pseudomonas aeruginosa and others). Staphylococcus aureus and Streptococcus pnemoniae and other Gram-positive bacteria are responsible for the remaining cases. In immunosuppressed patients, fungi, and bacteria, can cause sepsis.

The clinical manifestations secondary to inflammatory activation are nonspecific and include fever or hypothermia, tachycardia, tachypnea and respiratory alkalosis, leukocytosis or leukopenia with an increase in the number of sticks, hypermetabolism systemic, high consumption of oxygen, systemic hypoperfusion, acidosis and a circulatory condition hyperdynamic. The magnitude of these changes signs of sepsis does not seem to correlate well with the severity of the syndrome. However, the hypothermia and leukopenia can be independent risk factors for a dismal prognosis.

Systemic hypotension, microcirculatory defects, regional, tissue hypoxia and activation of the inflammatory cascade are related to injuries to multiple organs that characterize the clinical course of sepsis to severe sepsis. The lung and kidney dysfunction are usually recognized in the early stages, also by being part of routine clinical evaluation. The neurological disorders, liver and gastrointestinal disturbances are usually recognized, clinically, later, but already exist in the biochemical, from the outset septic.

In critically ill patient, whose levels of lactate in venous blood are between 20.0 and 40.0 mg / dl, the main objective is to determine whether or not there is hypoperfusion, because its cause could not detect potentially deleterious consequences.

This study aims to determine the usefulness of hyperlactatemia as a marker of tissue hypoperfusion (anaerobic metabolism) as a prognostic index in critically ill patients.

**Materials and Methods**

It was analyzed blood samples collected with calcium fluoride of individuals admitted to the ICU of the Society Santa Casa de Misericordia of Ourinhos, between the months of May to August 2008.

The ages ranged between 42 and 83 years on the basis of clinical suspicion or clinic presented by the patient.

The analysis was performed by the plasma automator Cobas Mira Plus CC (Roche Diagnostics), which uses optical system for reading the reactions of endpoint, kinetic, enzymatic and turbidimetry.

The reagent used was the manufacturer Bioclin, enzymatic method UV.

**Results**

We studied 24 subjects, with a total of 45 tests conducted for 180 days, and 62.5% females and 37.6% male with an average age of 64.95 years, with 16.66% with age between 40 - 49 years, with 29.16% aged between 50 - 59 years, 8.33% with age between 60 - 69 years, with 33.33% aged between 70 - 79 years and 12.50% with aged between 80 - 89 years. Of that total 8 people died, totaling 33.33%, where (2 individuals) 8.33% were male and (6 subjects) 25.00% were female.

**Discussion**

The object of the study subjects were divided into the following categories: Surgical (3 subjects), Renal (2 individuals), Shock (8 subjects), respiratory failure (4 subjects) heart (7 individuals). There was a predominance of suspected shock - 33.33%, followed by heart - 29.16%.

Of the individuals who had surgery, two have been programmed (an angioplasty and an exchange valve), they showed normal levels of lactate (angioplasty) or moderately increased (exchange valve), not reaching critical levels of 4 mmol \l, indicating good prognosis , Which can be verified by normalizing the lactate submitted during the development and recovery followed by discharge, but one involved in an emergency surgery for liver abscess, showed levels of lactate = 4 mmol \ l indicating poor prognosis. With the persistence of that value (more than 4 mmol lactate \l) in subsequent days this person was to death. Emergency surgeries have inadequate clinics condition and there are higher rates of morbidity and mortality. The measurement of lactate in the immediate postoperative period of cardiac surgery not at high risk proved to be a good indicator of morbidity and mortality in the evolution of the patients.

The two patients with renal blood lactate levels were within normal limits indicating good infusion and good prognosis, and consequent discharge from hospital.

Of individuals with suspected shock, 1 had toxic shock and 7 showed septic state. Two patients had initial levels of blood lactate = 4 mmol / l, with persistence of these levels, indicating poor prognosis evidenced by death. Of the remaining six, three of them had initial levels of lactate near the critical value of = 4 mmol \l, but with depreciation of those values in subsequent days, indicating improvement and good prognosis that can be confirmed by the discharge. The remaining 3 had blood lactate levels within the normal range or slightly altered helping the doctor to eliminate the chance of septic shock by choosing a more appropriate treatment and discharge.

Of the four individuals with respiratory failure, two of them progressed to respiratory failure and died, even so showing that normal levels of lactate. The respiratory failure is a leading cause of hospitalization in the intensive care unit and is also responsible for the high period of internment, featuring high morbidity, which examination correlated more currently displayed in initial diagnosis is the arterial blood gases. The other two had congestive obstructive pulmonary deficiency, with stable and blood lactate levels within the normal range with a good prognosis and consequent discharge. The analysis of respiratory failure versus blood lactate shows that the acute phase of lactate levels independent of the prognosis of the patient, proving its best utility in shock and hypoperfusion.

Individuals were involved in cardiac heart failure and acute myocardial infarction. Three individuals with critical situation confirmed by the level of blood lactate values with = 4 mmol \l thus remaining during the day, indicative of poor prognosis were to death. The 4 remaining two had initial serum levels of lactate = 4 mmol \l, but with reduced during the day to normal levels or near them, showing improvement in picture and discharge. The other two remaining showed normal levels of lactate indicating good prognosis and discharge.

**Conclusion**

The blood lactate as a marker of prognosis and monitoring of improvement or worsening of patients in ICU was effective when it is proposed in theory, being a great test to be correlated to the clinical diagnosis of patients suspected of whether traumatic shock or sepsis or in cases of tissue hypoperfusion.

The analyte proved to be not effective in the initial diagnosis of acute respiratory failure, the physiopathology presented by the disease and its rapid progress among the 24 - 48 hours early, which can culminate in death to the patient, if not treated immediately. In this case are considered signs, as dyspnoea, cyanosis and laboratory examination of venous gas

It was found that levels of blood lactate greater than 4 mmol / l is an indicator of poor prognosis in the context of clinical patients and the absence of depreciation of serum levels of lactate in the days following are good placemarks and indicators of morbidity / mortality of individuals.

The UV method available for routine laboratory available in the market for strength of analyte showed a good correlation between the result / clinical picture of the patient and can be used in daily routines when assessed its cost-benefit ratio.

**Key words:** blood lactate, shock and tissue hypoperfusion.

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**THE IMPORTANCE OF VENOUS BLOOD LACTATE FOR EARLY DISEASES' DIAGNOSIS THAT REQUIRE DAILY ROUTINES AND LOW COST**

**Abstract**

We present a comparative study of venous blood lactate dosage by enzymatic UV methodology obtained from 24 individuals, totaling 45 tests, with satisfactory results to clinical state, admitted to the ICU of the Society Santa Casa de Misericordia of Ourinhos, highlighting the differences in interpretation of diagnostic results as the clinical state and pathology, ranging since a respiratory failure hypoperfusion until a septic shock, made plain the main mechanisms by which these occur, demonstrating the effectiveness of lactate as an indicator of a prognosis in helping intervention therapy.

It was concluded that the methodology enzyme dosage for this analyte was effective and can be implanted into daily routines by presenting a low cost and a great ratio cost / benefit.

Key words: blood lactate, shock and tissue hypoperfusion.

**L'IMPORTANCE DU SANG VEINEUX LACTATE POUR LE DIAGNOSTIC PRÉCOCE DES MALADIES QUI NÉCESSITENT LA ROUTINE QUOTIDIENNE ET À FAIBLE COÛT.**

**Résumé**

Nous présentons une étude comparative de la force du sang veineux lactate par méthode enzymatique UV obtenu depuis de 24 personnes, pour un montant de 45 tests, avec des résultats satisfaisants à la clinique, admis à l'unité des soins intensifs de la société de Santa Casa de Misericordia de Ourinhos, mettant en évidence les différences d'interprétation de diagnostic que les résultats cliniques et de la pathologie, allant d'une insuffisance respiratoire, l'hypoperfusion jusqu'à ce qu'un choc septique, clairement les principaux mécanismes par lesquels ces cas, en démontrant l'efficacité de lactate comme un indicateur de pronostic pour aider d'intervention thérapie. Il a été conclu que l'enzyme méthodologie posologie pour ce analyte a été efficace et peut être implanté dans la routine quotidienne en présentant un faible coût et un grand rapport coût / bénéfice.

Mots clés: lactate de sang, le choc et l'hypoperfusion tissulaire.

**LA IMPORTANCIA DEL LACTATO SANGUÍNEO VENOSO PARA EL DIAGNOSTICO PRECOZ DE ENFERMEDADES QUE NECESITAN RUTINAS DIARIAS Y BAJO COSTO**

**Resumen**

Presentamos un estudio comparativo de la dosificación de lactato sanguíneo venoso por método enzimático UV obtenidos a partir de 24 individuos, totalizando 45 ensayos, con resultados satisfactorios al cuadro clínico, internados en la UTI de la Sociedad *Santa Casa Misericordia de Ourinhos*, destacando las diferencias de interpretación diagnósticos de resultados obtenidos conforme el cuadro clínico y patología que van desde una insuficiencia respiratoria, hipo perfusión hasta un choque séptico, elucidando los principales mecanismos por el cual esas ocurren, demostrando la eficacia del lactato como indicador de pronóstico auxiliando en la intervención terapéutica. Se Concluye que el método enzimático para dosificación de ese analito se mostró eficaz, pudiendo ser implantada en rutinas diarias por presentar un bajo costo y una óptima relación costo/beneficio.

Palabras claves: lactato serico, choque e hipo perfusión tejidual.

**A IMPORTÂNCIA DO LACTATO SANGÜÍNEO VENOSO PARA DIAGNOSTICO PRECOCE DE DOENÇAS QUE NECESSITAM DE ROTINAS DIÁRIAS E BAIXO CUSTO**

**Resumo**

Apresentamos um estudo comparativo da dosagem de lactato sangüíneo venoso por metodologia enzimática UV obtidos a partir de 24 indivíduos, totalizando 45 ensaios, com resultados satisfatórios ao quadro clinico, internados na UTI da Sociedade Santa Casa Misericórdia de Ourinhos, destacando as diferenças de interpretação diagnósticas de resultados obtidos conforme o quadro clínico e patologia que vão desde uma insuficiência respiratória, hipoperfusão até um choque séptico, elucidando os principais mecanismos pelo qual essas ocorrem, demonstrando a eficácia do lactato como indicador de prognóstico auxiliando na intervenção terapêutica.

Concluiu-se que a metodologia enzimática para dosagem desse analito mostrou-se eficaz, podendo ser implantada em rotinas diárias por apresentar um baixo custo e uma ótima relação custo/benefício.

Palavras chaves: lactato sérico, choque e hipoperfusão tecidual.